

INTER-GOVERNMENTAL MARITIME
CONSULTATIVE ORGANIZATION

101-104 PICCADILLY,
LONDON, W1V 0AE

Telegrams: INMARCOR-LONDON, W.1
Telephone: 01-499 9040



IMCO

SE/Circ.106
18 August 1981

RECEIVED
U.S. COAST GUARD
SEP 10 1981
Washington, D.C.
GAIA

INTERNATIONAL SYSTEM OF SEA ICE SYMBOLS

- 1 The Executive Committee of the World Meteorological Organization approved at its thirty-third session Recommendation 36 (80-CMM) concerning an International System of Sea Ice Symbols which will come into effect on 1 October 1981.
- 2 The International System of Sea Ice Symbols should be used when plotting observed ice conditions on operational charts prepared by sea ice forecasters. It contains a uniform set of symbols as well as the details to be shown on sea ice charts intended for international shipping, particularly by means of facsimile transmissions.
- 3 At the request of the World Meteorological Organization this international system, attached hereto, is brought to the attention of all Member Governments for action as appropriate.

Annex to Recommendation 36 (80-CMM)
INTERNATIONAL SYSTEM OF SEA ICE SYMBOLS

1. Use

The international system of sea ice symbols is intended for use on synoptic and prognostic ice charts which are issued by national ice centres, either by radio facsimile or by mail, primarily to serve operational marine activities. Charts transmitted by ice observing units to users should also follow the international system. Additional symbols determined on the basis of regional or national requirements may be added, provided that they do not overlap or contradict the international system.

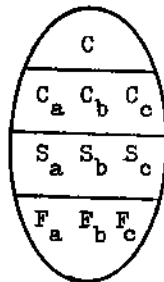
2. Main elements

The system encompasses ice elements and features which can be grouped under the following headings:

- (i) Concentration (C)
- (ii) Stage of development (S)
- (iii) Form of ice (F)
- (iv) Dynamic processes
- (v) Water openings
- (vi) Topography
- (vii) Ice thickness
- (viii) Stage of melting
- (ix) Surface features
- (x) Ice of land origin
- (xi) Limits
- (xii) Strips and patches

3. Main symbol

The basic data concerning concentration, stage of development (with amounts of up to three age classes) and form of ice are contained in a simple oval form (the egg; see appendix 2 for examples).



C - Total concentration of ice in the area, reported in tenths (see code table in Appendix 1).

Note: Ranges of concentration may be reported; see example in Appendix 2.

C_a C_b C_c - Partial concentrations of thickest (C_a), second thickest (C_b) and third thickest (C_c)^a ice, in tenths.

Note: Less than 1/10 is not reported. 10/10 of one stage of development is reported by C, S_a and F_a or C S_a F_p F_s.

Annex to Recommendation 36 (80-CMM)
INTERNATIONAL SYSTEM OF SEA ICE SYMBOLS

1. Use

The international system of sea ice symbols is intended for use on synoptic and prognostic ice charts which are issued by national ice centres, either by radio facsimile or by mail, primarily to serve operational marine activities. Charts transmitted by ice observing units to users should also follow the international system. Additional symbols determined on the basis of regional or national requirements may be added, provided that they do not overlap or contradict the international system.

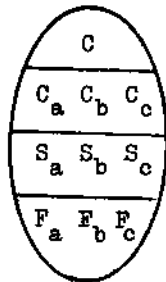
2. Main elements

The system encompasses ice elements and features which can be grouped under the following headings:

- (i) Concentration (C)
- (ii) Stage of development (S)
- (iii) Form of ice (F)
- (iv) Dynamic processes
- (v) Water openings
- (vi) Topography
- (vii) Ice thickness
- (viii) Stage of melting
- (ix) Surface features
- (x) Ice of land origin
- (xi) Limits
- (xii) Strips and patches

3. Main symbol

The basic data concerning concentration, stage of development (with amounts of up to three age classes) and form of ice are contained in a simple oval form (the egg; see appendix 2 for examples).



C - Total concentration of ice in the area, reported in tenths (see code table in Appendix 1).

Note: Ranges of concentration may be reported; see example in Appendix 2.

C_a C_b C_c - Partial concentrations of thickest (C_a), second thickest (C_b) and third thickest (C_c)^a ice, in tenths.

Note: Less than 1/10 is not reported. 10/10 of one stage of development is reported by C, S_a and F_a or C S_a F_p F_s.

ANNEX I

$S_a S_b S_c$ - Stage of development of thickest (S_a), second thickest (S_b) and third thickest (S_c) ice of which the concentrations are reported by C_a, C_b, C_c respectively (see code table and symbols in Appendix 1).

Notes:

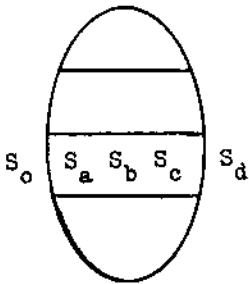
(1) If more than one class of stage of development remains after the selection of S_a and S_b , S_c should indicate the class having the greatest concentration of the remaining classes (see also Note (2)).

(2) Reporting of S_a, S_b and S_c should generally be restricted to a maximum of three significant classes. In exceptional cases, further classes can be reported as follows:

with S_o - stage of development of ice thicker than S_a but having a concentration of less than 1/10;

S_d - stage of development of any other remaining class.

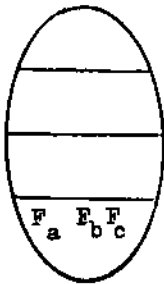
(3) No concentrations are reported for S_o and S_d .



Form of ice (F) - Two variants are possible according to the ice conditions observed:

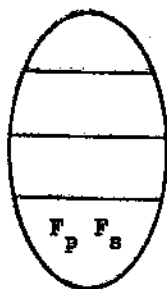
First variant

$F_a F_b F_c$ - form of ice (floe size) corresponding to S_a, S_b and S_c respectively (see code table in Appendix 1).

Notes:

(1) Absence of information on any one of these forms of ice should be reported with a "x" at the corresponding position.

(2) When icebergs are present in sufficient numbers to have a concentration figure, this situation can be reported with $F_a = 9$, the appropriate symbol for S_a and the corresponding partial concentration C_a (see example in Appendix 2).



Second variant

$F_p F_s$ - Predominant (F_p) and secondary (F_s) floe size, reported independently from S_a , S_b and S_c (see code table in Appendix 1).

Note: If only predominant floe size (form of ice) is reported, only the symbol for F_p shall be reported (see examples in Appendix 2).

4. Symbols for dynamic processes

- Compacting
- Diverging
- Shearing
- Drift

Supplementary procedures (optional):

Compacting:

- degree: 1 - Slight compacting
- 2 - Considerable compacting
- 3 - Strong compacting

Drift: (in tenths of knots) (e.g. 15 = 1.5 knots)

5. Symbols for water openings

- Crack (symbol indicating presence of cracks in the area)
- Crack (symbol for a crack at a specific location)
- Lead or
- Frozen lead (the orientation of the crosslines may be varied to distinguish them from other hatching lines)

Supplementary procedures (optional):

Lead (width) (width of lead in metres or kilometres, e.g. 100-300 m)

6. Symbols for topography features

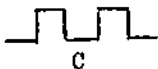
Ridges/hummocks f \bar{h}/h_x

Concentration (areal coverage) C in tenths
Frequency f in number per nautical mile (f is an alternative for C)
Mean height \bar{h} and maximum height h_x are expressed in decimetres.

Note: The data for C or f , \bar{h} and h_x are added where known.

ANNEX I.

Rafting



Concentration C as above to be added where known.

Windrow

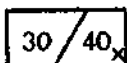


7. Symbol for ice thickness

Thickness measured t_E (t in centimetres)
E

Thickness estimated t_E (example: 35)

When more than one measurement have been taken, both mean and maximum thickness are reported as shown:



8. Symbol for stage of melting

Stage of melting



(see code table for m_s in Appendix 1)

9. Symbol for surface features

Snow cover:
























C - concentration (areal coverage) in tenths
s - snow depth, according to WMO Code 3800

The orientation of the symbol will show the direction of sastrugi, as follows:



10. Symbols for ice of land origin

| | | | |
|--|--|--|--|
| <p>n</p>  | <p>Growler and/or bergy bit</p> <p>Iceberg (size unspecified)</p> <p>Iceberg, small</p> <p>Iceberg, medium</p> <p>Iceberg, large</p> <p>Iceberg, very large</p> <p>Tabular berg indicated by adding a horizontal line through any of the above, e.g.</p> <p>Ice island</p> <p>Radar target (suspected berg)</p> <p>Ice of sea origin: Floeberg</p> |           |           |
|--|--|--|--|

n = number from WMO Code 2877

(Triangular symbol as at right)

YY day of month sighted







Note: The right-hand column of symbols may be used when many bergs are present but actual numbers are not known.

Specification of icebergs (as established by the International Ice Patrol Service):

| <u>Size</u> | <u>Height (m)</u> | <u>Length (m)</u> |
|---------------------|-------------------|-------------------|
| Growler & Bergy Bit | up to 5 | less than 15 |
| Iceberg, small | 6-15 | 16-60 |
| Iceberg, medium | 16-45 | 61-122 |
| Iceberg, large | 46-75 | 123-213 |
| Iceberg, very large | over 75 | more than 213 |


Note: Sizes refer to the above-water portion only. If height and length of a berg fall into different size classifications, use the larger size. Dimensions (in kilometres) of a tabular berg or ice island may be indicated beneath the symbol.

11. Symbols for limits


| | |
|---|---|
| Undercast |  |
| Limit of visual observations |  |
| Limit of radar observations |  |
| Ice edge by radar |  |
| Observed edge or boundary (Visual or satellite) |  |
| Estimated edge or boundary |  |

ANNEX I

12. Symbol for strips and patches

Strips and patches  C

C - concentration in tenths of ice within the area of strips and patches (Optional addition).

The symbol  C is placed within the main "oval" symbol in the section reserved for "Form of ice" (see Example in Appendix 2).


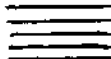




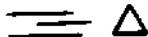

13. Supplementary procedures for indicating total concentration

In order to facilitate readability of the chart, ice-covered areas may be hatched according to total ice concentration. Hatching may be applied to all areas of ice concentration or only to some of them. Whenever hatching is applied, the hatching symbols as shown underneath shall be used. No international rules are given for the spacing or thickness of the hatching lines: the thickness may be the same throughout all hatched areas, or may vary in the sense that thickest lines are used for areas of thicker ice.

14. Symbols for the hatching of total concentration of sea ice

Fast ice  or  with national variation of hatching to show stage of development

Concentration

| | | |
|---------|-------------------------------|---|
| 10/10 | Consolidated pack ice compact | }  |
| 9-10/10 | Very close pack ice | |
| 7-9/10 | Close pack ice |  |
| 4-6/10 | Open pack ice |  (Line spacing is twice that of close pack ice) |
| 1-3/10 | Very open pack ice |  |
| <1/10 | Open water |  |
| 0 | Ice free |  |
| | Bergy water |  |
| | Presence of new ice |  (symbols may be scattered) |

15. Additional symbols for regional use

Symbol adopted for use in the Baltic Sea area:

Level ice



(Line spacing is twice that
of close pack ice)

Appendices: 2















TABLES OF ICE SYMBOLSTotal concentration of ice (C)

| <u>Concentration</u> | <u>Symbol</u> |
|--------------------------------|---------------|
| Ice free | |
| Less than one tenth | 0 |
| 1/10 | 1 |
| 2/10 | 2 |
| 3/10 | 3 |
| 4/10 | 4 |
| 5/10 | 5 |
| 6/10 | 6 |
| 7/10 | 7 |
| 8/10 | 8 |
| 9/10 | 9 |
| More than 9/10 less than 10/10 | 9+ |
| 10/10 | 10 |

ANNEX I, APPENDIX 1

Stage of development and thickness

(S₀ S_a S_b S_c S_d)

| <u>Numerical classification in International Glossary</u> | <u>Element</u> | <u>Thickness</u> | <u>Symbol</u> | <u>Alternative symbol</u> |
|---|-----------------------------------|------------------|---------------|---|
| | No stage of development | - | 0 | |
| 2.1 | New ice | - | 1 |  |
| 2.2 | Nilas; ice rind | <10 cm | 2 |  |
| 2.4 | Young ice | 10-30 cm | 3 |  |
| 2.4.1 | Gray ice | 10-15 cm | 4 |  |
| 2.4.2 | Gray-white ice | 15-30 cm | 5 |  |
| 2.5 | First-year ice | 30-200 cm | 6 |  |
| 2.5.1 | Thin first-year ice | 30-70 cm | 7 |  |
| 2.5.1a | Thin first-year ice, first stage | 30-50 cm | 8 |  |
| 2.5.1b | Thin first-year ice, second stage | 50-70 cm | 9 |  |
| 2.5.2 | Medium first-year ice | 70-120 cm | 1. |  |
| 2.5.3 | Thick first-year ice | >120 cm | 4. |  |
| 2.6 | Old ice | | 7. |  |
| 2.6.1 | Second-year ice | | 8. |  |
| 2.6.2 | Multi-year ice | | 9. |  |
| 10.4 | Ice of land origin | | ▲. | ▲ |

Notes:

(1) Use of symbols (figures):

On the horizontal line giving S_o S_a S_b S_c S_d only one dot (·) is to be placed to indicate the distinction between classes of any ice having a thickness over 70 cm (symbols 1. to 9.) from classes with thickness below 70 cm (symbols 1-9).

Examples:

| | | | |
|-----------------|--|-----------------|--|
| $S_a = 2.5.2$) | Symbol: $\left(\begin{array}{c} \text{1.7 3} \\ \hline \end{array} \right)$ | $S_a = 2.6$) | Symbol: $\left(\begin{array}{c} \text{7 4.6} \\ \hline \end{array} \right)$ |
| $S_b = 2.5.1$) | | $S_b = 2.5.3$) | |
| $S_c = 2.4$) | | $S_c = 2.5$) | |

| | | | |
|-----------------|--|------------------|--|
| $S_o = 2.6$) | Symbol: 7 $\left(\begin{array}{c} \text{4.7 3} \\ \hline \end{array} \right)$ | $S_a = 2.5.1a$) | Symbol: $\left(\begin{array}{c} \text{8 5 1} \\ \hline \end{array} \right)$ |
| $S_a = 2.5.3$) | | $S_b = 2.4.2$) | |
| $S_b = 2.5.1$) | | $S_c = 2.1$) | |
| $S_c = 2.4$) | | | |

| | |
|------------------|---|
| $S_o = 2.5.2$) | Symbol: 1· $\left(\begin{array}{c} \text{8 5 1} \\ \hline \end{array} \right)$ |
| $S_a = 2.5.1a$) | |
| $S_b = 2.4.2$) | |
| $S_c = 2.1$) | |

- (2) The dot-symbol which indicates a distinction between classes of stage of development should be placed midway between the top and the bottom of the figures.
- (3) Thickness figures for old ice, second-year ice and multi-year ice will be included in this table pending appropriate revision of the International Sea Ice Nomenclature. The separation of thin first-year ice into first and second stages (2.5.1a and b) will also be addressed at the same time.

ANNEX I, APPENDIX 1

Form of ice

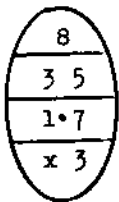
(F_a F_b F_c F_p F_s)

| <u>Element</u> | <u>Symbol</u> |
|---------------------------|---|
| Pancake ice | 0 |
| Small ice cake; brash ice | 1 |
| Ice cake | 2 |
| Small floe | 3 |
| Medium floe | 4 |
| Big floe | 5 |
| Vast floe | 6 |
| Giant floe | 7 |
| Growlers or floebergs | 8 |
| Ice bergs | 9 |
| Undetermined or unknown | x (for F _a F _b F _c only) |

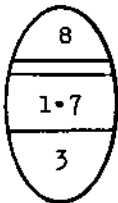
Stage of melting

(m_s)

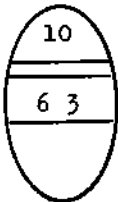
| <u>Element</u> | <u>Symbol</u> |
|--------------------|---------------|
| No melt | 0 |
| Few puddles | 1 |
| Many puddles | 2 |
| Flooded ice | 3 |
| Few thawholes | 4 |
| Many thawholes | 5 |
| Dried ice | 6 |
| Rotten ice | 7 |
| Few frozen puddles | 8 |
| All puddles frozen | 9 |

EXAMPLES OF THE USE OF THE "OVAL" SYMBOLExample 1

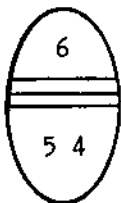
8 tenths of ice; 3 tenths of medium and 5 tenths of thin first-year ice; floe size of medium first-year ice is not known; the floe size of thin first-year ice is small floe.

Example 2

8 tenths of ice; medium and thin first-year ice of which the partial concentrations are not given; predominant floe size is small floe.

Example 3

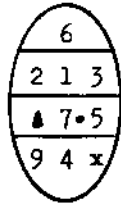
10 tenths of ice; first-year and young ice of which the partial concentrations are not given; no information on form of ice (this example applies particularly to satellite data).

Example 4

6 tenths of ice in big and medium floes; stages of development not given and therefore there are no partial concentrations.

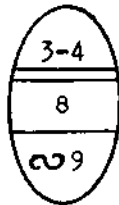
ANNEX I, APPENDIX 2 . . .

Example 5



6 tenths of ice; 2 tenths concentration of ice berge, one tenth of old ice and 3 tenths of gray-white ice; the floe size of old ice is medium floe.

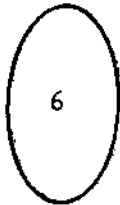
Example 6



3 to 4 tenths of ice; all thin first-year ice of 30-50 cm thickness; in strips and patches where the concentration is 9 tenths.

(With one stage of development, indication of partial concentration is not needed).

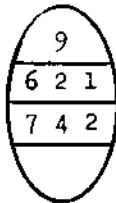
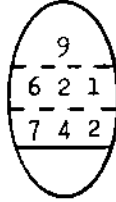
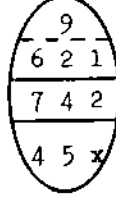
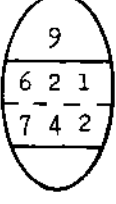
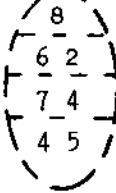
Example 7



6 tenths of ice; no other details given.

In general, throughout the symbology solid lines are used for observed data and dashed lines for estimates. For indicating estimates in the "oval", see following examples.

ANNEX I, APPENDIX 2.

| <u>Known data</u> | <u>Estimated data</u> | <u>Missing data</u> | <u>Symbol</u> |
|--|---|---------------------|---|
| Concentration, partial concentrations and stage of development | | Floe size |  |
| Concentration | Partial concentrations and stage of development | Floe size |  |
| Concentration, stage of development and floe size | Partial concentrations | |  |
| Concentration and partial concentration | Stage of development | Floe size |  |
| | All data | |  |

WORLD METEOROLOGICAL ORGANIZATION

=====

W/MA/SI, ANNEX II

Resolution 4 (EC-XXXIII)

INTERNATIONAL SYSTEM OF SEA ICE SYMBOLS

THE EXECUTIVE COMMITTEE,

NOTING strong requirements expressed by both operational and research users for the development of a uniform system of sea ice symbols,

CONSIDERING that the adoption of an international system of sea ice symbols permits the development of a uniform system for the digitization of sea ice information for international exchange,

APPROVES Recommendation 36 (80-CMM) - International system of sea ice symbols - effective from 1 October 1981,

REQUESTS the Secretary-General to include the International System of Sea Ice Symbols in WMO Publication No. 259 - WMO Sea Ice Nomenclature, as well as in WMO Publication No. 471 - Guide to Marine Meteorological Services.
